Abstract

The principal method of evaluation of new design ideas in processor design is cycle level microarchitecture simulation The simulation involves developing a simulator for the model of the new design, or modifying an existing simulator to simulate the new model These tasks involve programming and debugging effort on the part of the designer, resulting in increased evaluation time for the design Moreover, an infrastructure for validation of the simulation results is not provided by existing simulators Validation of simulations adds to the credibility of the simulation results

An automatic simulator generator takes as input a specification of a model of the design in an architecture description language and produces a debugged simulator The use of an automatic simulator generator removes the programming and debugging component from the evaluation time for the design But, automatic simulator generators are traditionally slower than hand-coded simulators Moreover they do not support infrastructure for validation

We have developed the *August* system for automatic generation of cycle level microarchitecture simulators August stands for Automatic Generation of Usable Simulation Tools The August specification scheme is designed to facilitate the specification of architectural features of modern processors We have identified the granularity of coupling of functional and performance simulations, as a critical parameter influencing the speed and accuracy of simulators, and used it to provide the facility for exercising the speed accuracy trade-off with different specifications August generated simulators use a compiled simulation strategy, instead of the interpreted simulation strategy used in other microarchitecture simulators A compiled simulator is a program which runs on the host machine to simulate the execution of a target program on the target machine An interpreted simulator, on the other hand, simulates the execution of the target program on the target machine by iteratively fetching, decoding and simulating the execution of target instructions in the main simulator loop. Using compiled simulation, August generated simulators achieve two times the speed of interpreted automatically generated simulators The August specification of architectural components is a state-based, formal specification, which supports the development

of a validation infrastructure for August generated simulators The August system is flexible and facilitates specification of new and different design features with minimal code modifications The specification is designed to provide adaptability to different simulation tasks and metrics